



Female-to-male transgender chest reconstruction: A large consecutive, single-surgeon experience

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Summary *Introduction:* Chest reconstruction in the female-to-male transgender individual is not a common procedure due to the low prevalence of intractable gender dysphoria. It means that few surgeons acquire sufficient expertise and many UK patients find themselves travelling abroad to centres such as Singapore, Amsterdam and the United States.

Patients and methods: This study retrospectively evaluated 100 consecutive patients of a single surgeon over a 3-year period with prime outcome measures including surgical technique, complications, surgical revision and patient-reported satisfaction, using a simple, 1–5 linear analogue scoring system.

Results: The median age was 28 years with a median excision of 345 g per breast. Complications occurred in 11 patients, five of which required surgical haematoma evacuation. Chi² analysis failed to show a correlation between testosterone supplementation and haemorrhagic sequelae ($p > 0.1$). To date, 16 patients have undergone supplementary surgery, predominantly axillary dog-ear revision. Overall patient-reported satisfaction was 4.25.

Conclusions: Whilst only a part of the process in gender transitioning, chest reconstruction is important as it is frequently the initial surgical procedure and enables the large-breasted to live in their chosen role much more easily. Historically associated with high rates of both complication and revision surgery, this study demonstrates that both may be appreciably lower and associated with high levels of patient satisfaction so that there is a realistic, high-quality option for British patients who might otherwise feel the need to travel abroad for their surgery.

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Introduction

Gender identity disorder encompasses numerous terms including transgender (TG), transexualism, transsexism and gender dysphoria that describe individuals with a persistent psychological discomfort related to their anatomical sex and a desire to live and be accepted as a member of the opposite sex.¹ Reported prevalence figures vary worldwide from 0.17:100,000 in Sweden² to 17.9:100,000 in Singapore³ with male-to-female (MtF) outnumbering female-to-male (FtM) by 4:1.⁴ These figures may be somewhat inexact as the low number of reporting centres may distort population statistics. In the UK there exists a degree of geographical variation with some health authorities being more sympathetic than others: figures ranging, by county, between 10 and 44:100,000.⁵ Not being a common procedure, mastectomy for biological females with gender dysphoria tends to gravitate to those health professionals with both a particular interest and the expertise.

Historically, there has been little scientific study for guidance, usually small personal series combining mixed techniques.^{6–10} Recently, a large series allowed the proposition of a treatment algorithm.¹¹ Generally, two avenues have been pursued: that of aesthetic female breast surgery, in the form of mastopexy and reduction, and male based on gynaecomastia surgery. The FtM population form a novel group of those with an underlying feminine thorax, but the need to masculinise it as much as possible so gynaecomastia techniques have provided frequent inspiration.

Mastectomy in FtM individuals is frequently the initial surgical procedure¹² in what might be a long sequence so both sets the tone and, importantly, facilitates living in the chosen gender role, particularly when the breasts are large. The senior author has had an interest in TG surgery for many years, with a particular focus on chest reconstruction in female-to-male transgender patients. The aim of this study was the independent analysis of a 3-year, consecutive cohort of patients treated by a single surgeon with an established practice and techniques.

Patients and methods

Case notes of all patients undergoing chest reconstruction surgery as part of permanent FtM gender transition were independently reviewed between July 2007 and August 2010. Information included standard demographic data such as age at surgery, procedure, hormone medication status, medical comorbidity and nicotine abuse. Complications and revision surgery were recorded and overall

patient satisfaction obtained at outpatient review using a linear analogue scale from 1 to 5 (1 being poor and 5 excellent). Patients attended one week after surgery for wound assessment and removal of NAC graft tie-over. Thereafter, they were offered planned review at 6 weeks and 6 months and upon request subsequently.

In preparation for surgery each patient was assessed by gender-specialist clinicians. Those who underwent surgery via NHS (National Health Service) gender clinics conformed to the specific regional protocol. Those assessed in the private sector followed the World Professional Association for Transgender Health (WPATH) criteria.¹³ Typically, patients have legally changed their name prior to surgery. Whilst the majority will have been living full-time in the male role for a number of months, some have not depending on individual preference. The vast majority will have been taking masculinising hormones and this, due to the permanent effect on vocal intonation, constitutes an irreversible step. A small number have not commenced hormone therapy for a number of reasons: (i) the desire of some to live androgynously, identifying neither as male or female, but wishing chest reconstruction to improve comfort with their own bodies; (ii) very large breasts can make it all but impossible to pass as male; (iii) a small number of individuals already appear sufficiently masculine so do away with the adverse effects and reliance on medical assistance; (iv) those with a view that chest reconstruction is of paramount importance so testosterone therapy commences subsequently.

Psychological assessment was made in all cases by two clinicians, one usually a psychiatrist, and initial discussion of the treatment options was undertaken by the gender specialist. This is reiterated in greater depth during at least one surgical consultation during which a detailed history and clinical examination is supplemented by a Powerpoint presentation showing a range of outcomes so that reasonable expectations can be maintained. Prospective patients are also directed towards a detailed information brochure written expressly for trans-men by the organisation FTM London.¹⁴

Surgical technique

Although a total of three techniques were used (Table 1), the majority underwent mastectomy with free nipple graft (M+FNG). Liposuction was standard suction-assisted (SAL) and periareolar involved either inferior hemi-circumferential incision or with an additional lateral, horizontal extension – termed ‘extended periareolar’. All

Table 1 Distribution of surgical techniques and their frequency.

		Primary	Secondary	Revision	Median excision g (range)
Mastectomy + nipple graft		79	4	2	376 (42–2600)
Periareolar	Standard	7	2		83.5 (15–187)
	Extended	4			
Liposuction		2			450 ^a (150–750)
	Σ	92	6	2	

Excision weights refer to individual breasts.

^a Lipoaspirate in mL.

Table 2 Distribution of complications and the resulting patient scores.

Complication	Number	Original procedure	Management	Final score
Haematoma	6	M+FNG = 5 PA = 1	5 RTT No, but desquamation	4.5 3
Infection	3	M+FNG	Antibiotics	3.7
NAC loss	Partial 1 Total 1	M+FNG M+FNG		DNA 4
	Σ 11			

NAC, nipple–areola complex; M+FNG, mastectomy + free nipple graft; PA, periareolar.

operations were bilateral and performed by the senior author.

In M+FNG the infra-mammary fold is delineated whilst standing and the upper incision sits marginally above the superior border of the current areola. Whilst this may appear overly conservative, it is surprisingly easy to over-resect and lead to difficulties with closure and consequent elevation of the infra-mammary scar. Incision lines are infiltrated with a bupivacaine–adrenaline mixture prior to excision¹⁵ and the nipple harvested as a full-thickness graft, tailored between 2 and 3 cm, according to the patient's height, weight, overall size and thoracic girth. Each graft is stored in a marked moist swab.

The breast is then excised firstly inferiorly in the infra-mammary fold (IMF) itself¹⁶ rather than above on the breast.¹¹ The objective being simulation of the infero-lateral margin of pectoralis major muscle as seen in the male chest. A superiorly orientated bevel allows an appraisal of the individual subcutaneous tissue thickness that may then be replicated in the upper flap. Pectoral fascia is preserved and liposuction employed laterally in cases of axillary excess. Subcutaneous fat is preserved not only for overall contour, but to minimise scar retraction, between skin and fascia, and particularly important to support the NAC and avoid the stigmatic 'dished out' effect. After weighing of the specimens, closure is performed with absorbable sutures, and the patient sat erect to confirm symmetry. At this stage, the neo-NAC positions are determined, predominantly with bi-dimensional characteristics, but importantly also by eye. A large-bore (16Ch gauge) suction drain is placed and removed the following morning. A tie-over dressing and elastic compression tape are applied and left *in situ* for 1 week. Tubigrip is recommended thereafter for at least 3 weeks.

Analysis was performed using a combination of descriptive statistics and the χ^2 test for discrete variable comparison.

Results

General demographics

The median age of the 100 patients in the study was 28 years (range 18–55). In the cohort were 92 undergoing primary surgery, six secondary surgery from elsewhere and two revision from the senior author's practice. A median of 345 g was excised (15–2600 g) and Table 1 further details this by technique. Seventeen had additional medical comorbidity (asthma – 12; hypertension, hypothyroidism,

multiple sclerosis, Scimitar syndrome and obesity each a single instance) and 29 admitted to being current cigarette smokers. Masculinising hormones were currently taken in the majority (88), in the form of injectable (80), topical (7) or oral (1) testosterone.

There were 11 complications, five of which required a return-to-theatre (RTT) for evacuation of haematoma. A late-presenting haematoma was managed conservatively as were three wound infections with enteral antibiotics alone. The final complication involved the brief re-admission of one patient with a rapid increase in post-operative drainage: this was also managed expectantly. Although all haematomata occurred in those taking testosterone, statistical significance was not demonstrated with a *P* value of >0.1 being returned. Judging by grades given (Table 2) development of a complication was not detrimental to the overall patient satisfaction.

With respect to revision surgery, 16 patients have thus far undergone secondary procedures (Table 3), chiefly dog-ear excision under local anaesthesia (10). Two have undergone nipple reduction by shave excision and one small volume liposuction under local anaesthesia. A single subject has undergone contour revision under general anaesthesia. A further two are annotated to be awaiting revision, so the final revision rate may reach 18%, however, all were last seen at least 6 months previously and have failed to attend at least one planned review appointment. Eight have experienced some degree of hypertrophy in the long horizontal scars, however, all but one settled satisfactorily with topical silicone treatment.

Not all have returned for surgical review following their surgery: 23 having failed to attend after wound review at one week. A further 22 have attended the 6-week outpatient review only. The remaining 55 have been followed for a median of 7 months (range 4–34) and provided a mean final satisfaction score of 4.25 (median 4; range 2–5). As the breakdown in Table 4 shows, liposuction and primary

Table 3 Requirement for secondary surgery.

	Complication	Number
Local	Axillary dog-ear	10
	Nipple shave	2
	Liposuction	1
	Scar revision	1
General	Flap thinning/contour	2
	Σ	16

Table 4 Satisfaction scores by individual procedure.

	Number	Mean	Range
Liposuction	2	2.5	2–3
Primary PA	7	3.3	3–4
Primary extended PA	4	4.5	4–5
Primary M+FNG	79	4	3–5
Secondary M+FNG	3	5	5
Secondary PA	2	4	4
Revision M+FNG	3	4.5	4–5
Σ	100		

M+FNG, mastectomy + free nipple graft; PA, periareolar.

periareolar seemed to be the least and secondary and revision M+FNG the best accepted by patients. Representative examples are given in [Figures 1–5](#).

Discussion

Chest reconstruction in the transgender male is only one element of the gender reassignment process and is ideally undertaken within a multidisciplinary setting, based on shared care between experienced professionals. Over the last four decades, guidelines have been regularly revised.¹³ It is usual to commence masculinising hormones prior to surgery as vocal tone changes are effectively irreversible. Testosterone assists with the Real-life Experience (RLE), in

which prospective patients live in the chosen, as opposed to innate gender role. It may also have beneficial effects on breast tissue atrophy, but this is not always significant. There are those who undergo surgery in advance of hormonal therapy due to large and prominent breasts that cannot be satisfactorily concealed by binding, as with 12% in our study.

Surgical considerations – thoracic contour

The key features of thoracic wall re-contouring are well known¹²: the starting point being a recognition and appreciation of the differentiating features between the genders and the need for thoracic masculinisation by obliteration of the female contour. Deletion of the infra-mammary fold and avoidance of 'feminine' scar patterns where possible is also helpful.

Considerable efforts have been expended in the search for minimal scars in surgery of the female breast so there is now a well-recognised ladder of scar burden descending from the inverted-T, through lateral or vertical-scar to periareolar. These scars may, however, be disproportionately stigmatic on a male thoracic wall so today's options for transgender chest reconstruction have evolved slightly differently: this is not particularly surprising given that the aims are actually quite different. In the 1990s, Hage expanded on the Amsterdam repertoire of three main techniques⁷: with minimal skin redundancy, transareolar mastectomy could be combined with concentric periareolar deepithelialisation. Greater volume or ptosis was addressed

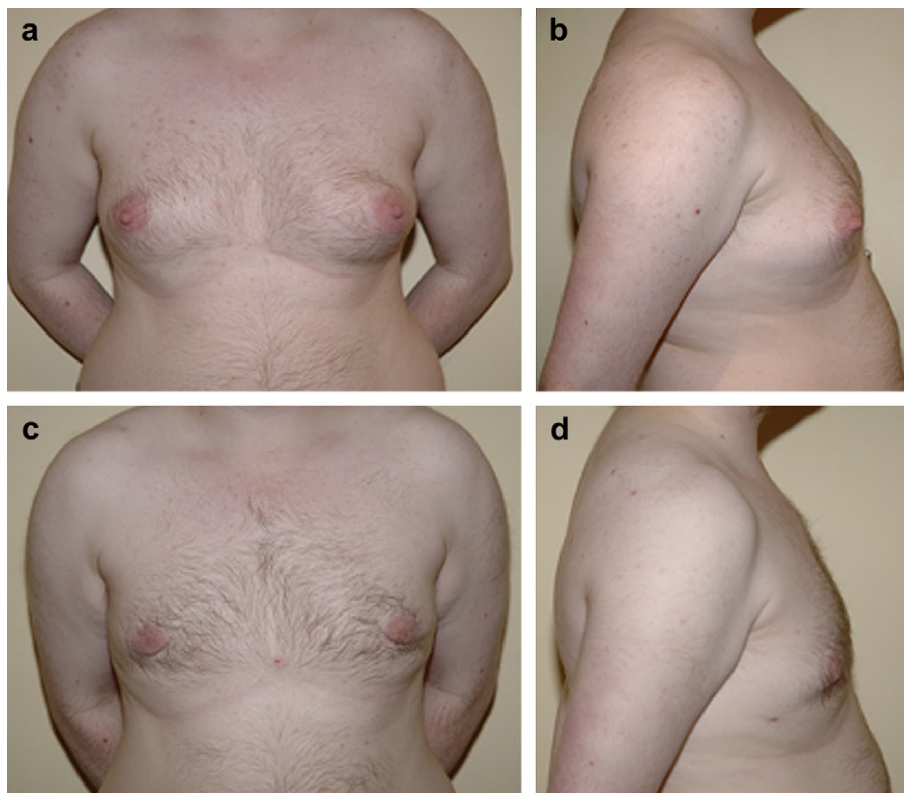


Figure 1 Representative example of peri-areolar technique with post-operative views at 6 months. (C & D) The patient underwent excision of 32g right and 46g left and graded the result good at 4 out of 5.

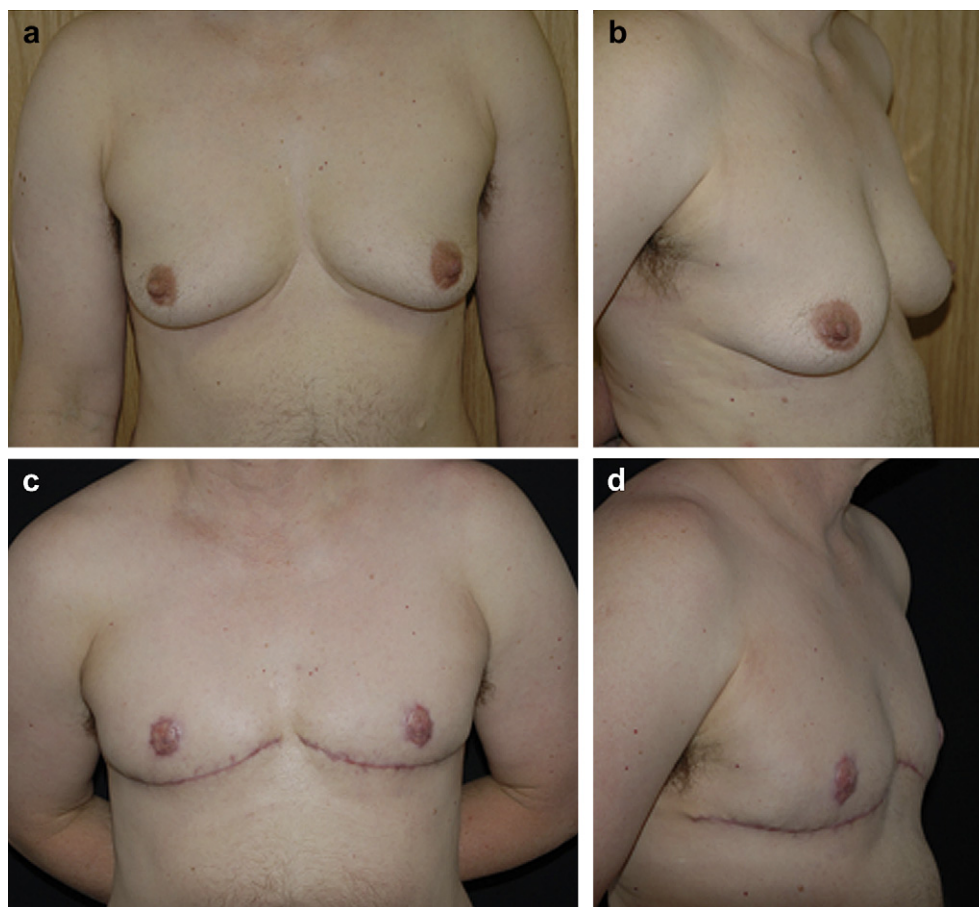


Figure 2 A 'small' mastectomy with nipple graft (193 g and 195 g right and left respectively). This patient was delighted giving a final score of 5.

with horizontal extensions and the largest breasts underwent fusiform excision with a NAC graft lying over the horizontal scar. Most recently Monstrey et al.'s algorithmic approach proposed five options for four parenchymal–envelope combinations.¹¹ The senior author's philosophy over the past 20 years has been similar comprising the following, in ascending order of: liposuction, peri- and circumnareolar and amputation with graft of the NAC. Liposuction might appear the ideal in light of its minimal invasiveness and scarring, but as seen in our cohort, is little used and rarely appreciated by patients. There are two reasons for this, firstly, masculinising hormones and binding have often led to a diminution of breast volume, but predominantly adipose so the remaining glandular tissue responds poorly to liposuction. Secondly, diminution of breast volume is not invariably accompanied by a corresponding decrease in the soft-tissue envelope. Such ptosis, and disproportionate skin excess, is further exacerbated by the tight binding performed by these patients.¹² Patients with little adipose tissue frequently present with a firm, subareolar parenchymal remnant of varying dimensions that is eminently suitable for a periareolar approach. It is usual to start with an inferior hemi-circumnareolar incision that may be extended laterally or bilaterally to allow improved access, particularly where the areola is small. This too was an infrequent approach in this cohort, with a high proportion of larger breasts (range 15–2600 g; Table 1) in contrast to Colić and Colić who

reported only a concentric, periareolar approach in their series of 12 with much smaller excision weights (120–300 g).⁸ Circumnareolar techniques, of course, do carry the advantage of allowing concurrent areolar reduction. Interestingly, and in agreement with Monstrey et al.,¹¹ we found the primary extended PA technique to give a high rate of satisfaction.

This study is predominantly concerned with breasts and soft-tissue envelopes at the larger end of the spectrum and involves the technique of mastectomy and free nipple graft as originally described by Thorek.¹⁷ It is important to note that it is not the equivalent of oncological mastectomy as it leaves some remnant upper pole breast tissue: all patients must be counselled accordingly and routine breast cancer screening recommended. There is an older technique whereby the NAC is grafted onto the scar,¹² but this is now accepted to produce suboptimal results in addition to removing the *trompe l'oeil* effect of the IMF scar resembling an inferior pectoral groove. Potential downsides of the technique are the long scars and risk of NAC loss. Whilst the former are often noticeable when immature and active, they tend to settle well if correctly sited and others have recently stated that such scars give better long-term outcomes than extended periareolar techniques.¹¹ Selection of the most appropriate technique, irrespective of scar burden, is preferable to stretching a technique beyond its natural boundaries.

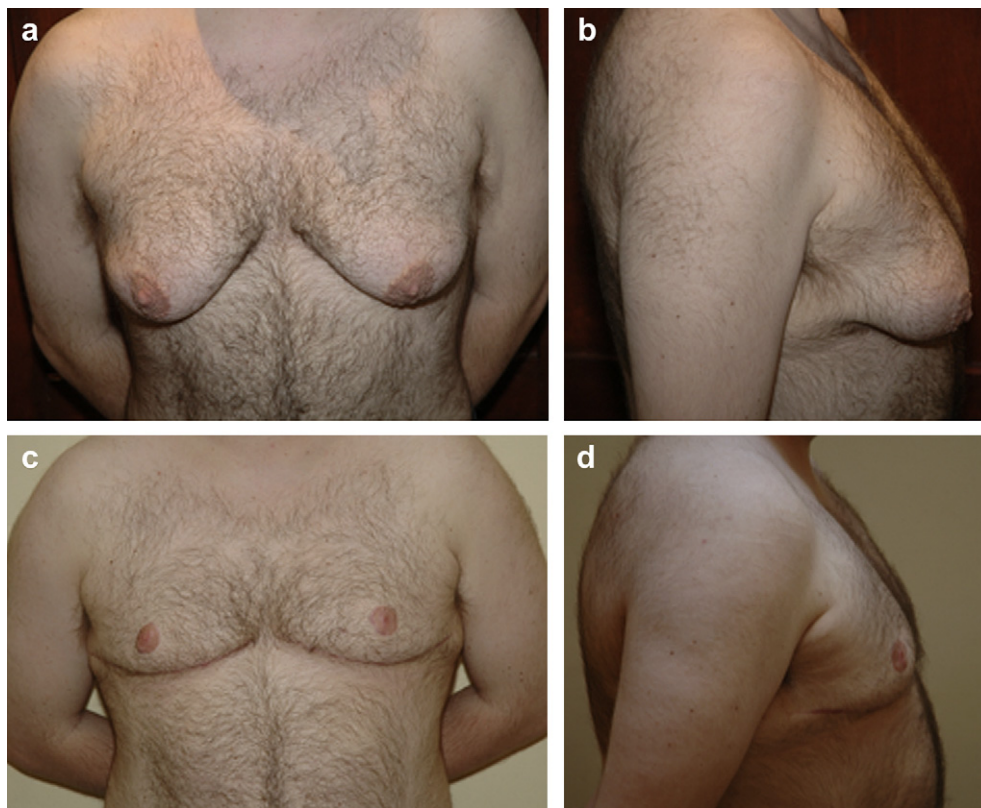


Figure 3 Example of a 'moderate' mastectomy and free nipple graft that received a score of 5 following excision of 300 g each side.

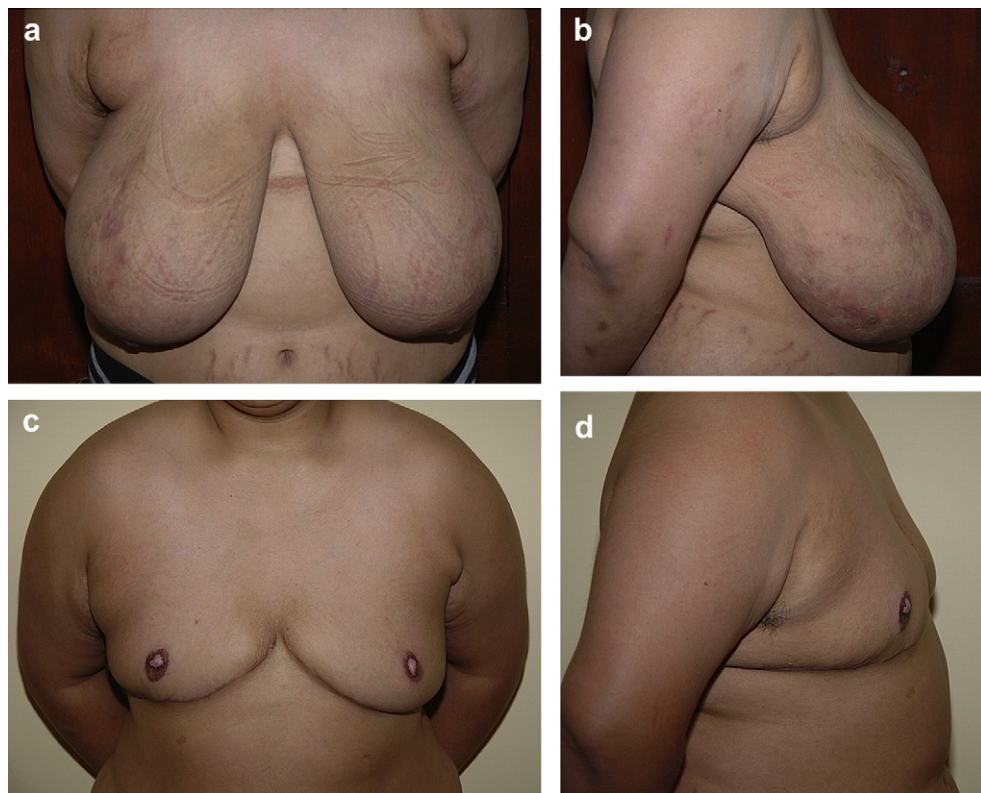


Figure 4 Example of a 'large' mastectomy and free nipple graft, which received a score of 4 following excision of 2600 g from the right and 2400 g from the left.

Surgical considerations – NAC location

The appropriate, symmetrical and aesthetically acceptable positioning of the NAC is key to successful mastectomy and free nipple graft (M+FNG) in severe gynaecomastia.¹⁸ It is equally so in transgender surgery, but judging by the number of different reports, the optimal system has yet to be described (Table 5^{18–20}). From a specific transgender perspective there is less to guide us. McGregor's novel method employs sutures inserted into the sternal notch (SN), mid-clavicular and mid-sternal lines at a point midway between elbow crease and axillary crease. When pulled taut, the intersection point sites the neo-NAC, but this system relies on several soft-tissue rather than bony landmarks.¹⁶ Monstrey et al state that "absolute measurements can be misleading"¹¹ and we echo this sentiment for the important reason that previous studies^{19–21} were undertaken on male subjects. The TG torso is, of course, biologically female and obvious differences include a narrower thorax and a closer thorax-to-pelvis ratio. Whilst the above provide an indication of the approximate location, it is imperative to sit the patient erect and effect final adjustments by eye before engraftment. Of course, experience is helpful

and this series' rate of six specific NAC problems (two excessively high, two asymmetrical and two partial/full loss) is the fruit of 20 years' experience. The most common error is leaving the NACs too large, too high and too medial.²¹

Complications and additional surgery

Relatively high complication rates, from 11 to 33%,^{8–10} have been reported in FtM series. Our own rate of 11% includes an acute return-to-theatre rate of 5% for haematoma evacuation. Even with relatively lower duty procedures such as circumnareolar mastectomy, two of a series of 17 (12%) suffered areolar necrosis, one requiring a skin graft.⁸ Another series (16 mastectomies and one periareolar) had a relatively high complication rate of 23.5% with two haematomata, one wound infection and one dehiscence. Whilst the literature has no published evidence to support the impression of a slightly higher haemorrhagic tendency in patients taking supplemental testosterone, some cease medication 2–3/52 pre-operatively.^{11,22} Albeit with limited numbers, this study shows a lack of statistical correlation between testosterone and haematoma formation.

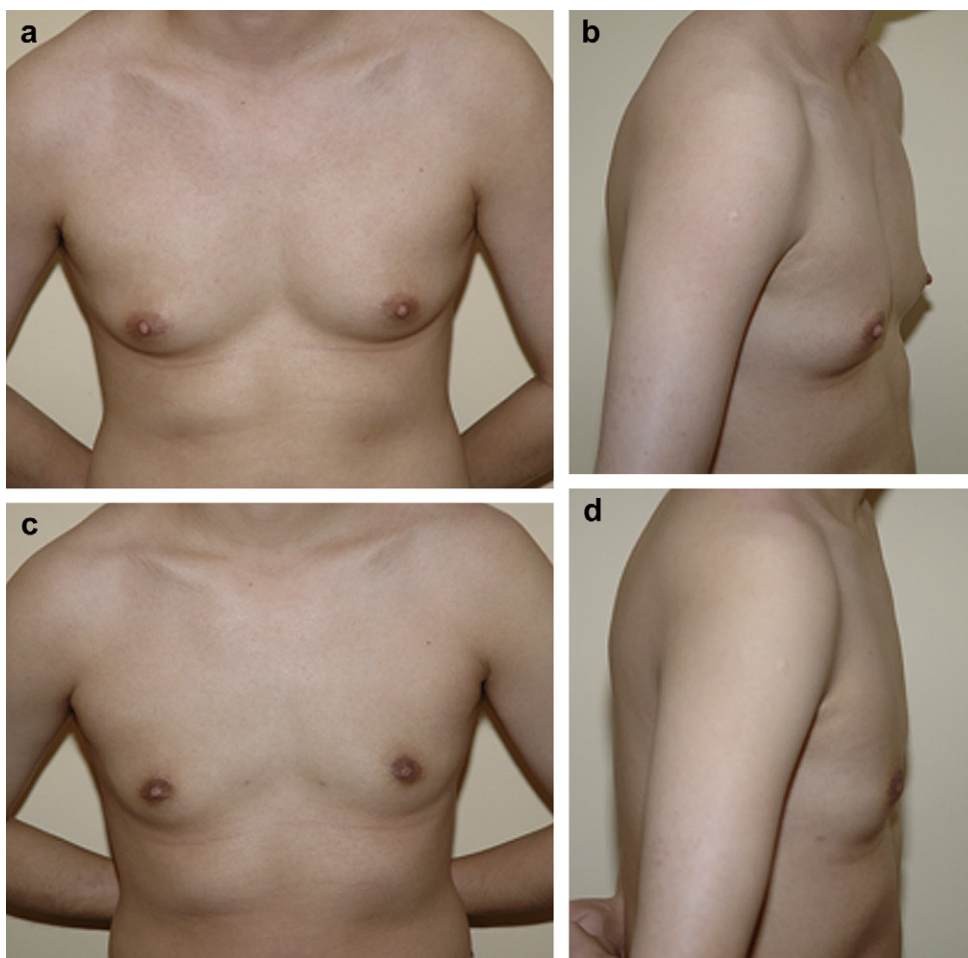


Figure 5 Operative series of a small-volume (150 cc each side) liposuction. The patient felt it underdone despite a good contour otherwise and graded it 3.

Table 5 NAC location and areolar dimensions in the male.

Author	N	SN–N (cm)	N–N (cm)	Other	Areolar diameter (cm)	Comments
Murphy ¹⁸	20	21	0.23 × girth	SN–N plane = 0.33 SN–pubis	2.8	Aesthetically perfect
Beckenstein ¹⁹	100	20	21	MCL–N	2.8	Ideal BMI, no gynaecomastia
Beer ²⁰	100			Horizontal ^a Vertical ^b	Oval 2.7 × 2.0	Military subjects

SN–N, sternal notch–nipple distance; N–N, nipple–nipple distance.

^a Horizontal (2.4 cm + [0.09 × thoracic circumference {cm}]).

^b Vertical (1.2 cm + [0.28 × sternal length {cm}]).

Gender reassignment is complex and multi-staged, but even the apparently facile female-to-male chest reconstruction carries a revision rate of 17.6%⁸ to 41.2%¹⁰ in some quarters. Our own rate of 15–18% may appear high, but should not necessarily be taken as an indication of substandard primary surgery: the two nipple shaves being simple procedures under local anaesthesia when the NAC graft has taken. Axillary dog-ears are more contentious as patients usually request the shortest scars possible, but often carry extra weight to conceal the breasts. This they shed when there is no need to disguise the chest and the standing cones may become more obvious.

Follow up

Up to 25% loss to follow up was reported as far back as the 1970s when the stigma was perhaps greater and people less accommodating.⁴ Our own rate is of a similar order of magnitude, but reflects the national nature of the practice, which regularly takes patients from all parts of the United Kingdom. In fact, a geographic variation exists as certain health services are known to be more favourable to requests for transsexual surgery.⁵ In the process of gender transitioning, the surgeon is often only one small part, taking the role of a technician in the view of some. Finally, when discussing this issue we understood from a TG spokesman that such patients are not reluctant to seek medical attention. Furthermore, all patients enter into an agreement whereby revision is generally covered as part of the package so one may extrapolate that 'no news is good news'.

Patient satisfaction

A recent systematic review in transgender surgery reiterated the paucity of controlled or prospective studies and lack of validated assessment.¹ Even for assessment of the far more common breast cancer and reconstruction, it has taken many years to approach reliable and reproducible assessment tools.²³ Whilst satisfaction is a subjective evaluation of the overall quality of healthcare received, it is becoming increasingly important not only from a clinical governance perspective, but to allow both patients and practitioners the means to assess and evaluate different treatment options. Previous attempts have been made with respect to overall service delivery from psychological perspectives,²⁴ Quality of Life,²⁵ General Health

Questionnaire²⁶ and studies of regret.^{27,28} There are few studies of specific surgical procedures and the numbers are small, for example, Nelson et al. recently reported a 5-year series where 12, of 17, patients responded and 11 expressed satisfaction with their surgery and no regret.¹⁰ Our own study echoes the lack of validated assessment and has stimulated the development of a more detailed, prospective assessment proforma that is intended to improve upon future information and evaluation of satisfaction.

Conclusion

Transgender chest reconstruction carries its own aesthetic challenges. The rate of complications in experienced hands tends to be acceptable. Testosterone supplementation does not appear to predispose to haemorrhagic sequelae and high degrees of satisfaction may be achieved.

Conflict of interest/funding

None of the authors has a conflict or any funding to declare.

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